

What is claimed is:

1. A semiconductor device comprising:
a semiconductor substrate;
an insulating layer formed on the semiconductor substrate and having a
5 contact hole therethrough;
a diffusion barrier layer formed on a surface of the insulating layer and on
surfaces within the contact hole; and
a contact plug which comprises a first sub-plug that fills a lower portion of the
contact hole and a second sub-plug that fills an upper portion of the contact hole on
10 the first sub-plug.
2. The semiconductor device of claim 1, wherein the first sub-plug is
formed of tungsten and the second sub-plug is formed of titanium nitride.
3. The semiconductor device of claim 2, wherein the titanium nitride is
15 formed to a thickness of no greater than approximately 1000 Å.
4. The semiconductor device of claim 2, wherein the diffusion barrier
layer is formed of titanium/titanium nitride.
5. A method for manufacturing a semiconductor device comprising:
forming an insulating layer having a contact hole therethrough on a
semiconductor substrate;
forming a diffusion barrier layer on a surface of the insulating layer and on
25 surfaces within the contact hole; and
forming a plug in the contact hole by forming a first sub-plug that fills a lower
portion of the contact hole and forming a second sub-plug that fills an upper portion
of the contact hole on the first sub-plug.
6. The method for manufacturing a semiconductor device of claim 5,
30 wherein forming a first sub-plug comprises forming a first metal layer on the

insulating layer having the contact hole therethrough and etching back the first metal layer to a predetermined depth to expose a void in the first metal layer, if any.

5 7. The method for manufacturing a semiconductor device of claim 5, wherein forming a second sub-plug comprises forming a second metal layer on the semiconductor substrate on which the first sub-plug has been formed and polishing the second metal layer so as to expose a top surface of the diffusion barrier layer on the insulating layer.

10 8. The method for manufacturing a semiconductor device of claim 6, wherein forming a second sub-plug comprises forming a second metal layer on the semiconductor substrate on which the first sub-plug has been formed and polishing the second metal layer so as to expose a top surface of the diffusion barrier layer on the insulating layer.

9. The method for manufacturing a semiconductor device of claim 5, wherein the first sub-plug is formed of tungsten.

15 10. The method for manufacturing a semiconductor device of claim 5, wherein the second sub-plug is formed of one of tungsten and titanium nitride.

11. The method for manufacturing a semiconductor device of claim 5, wherein the second sub-plug is formed to a thickness no greater than 1000 Å.

25 12. The method for manufacturing a semiconductor device of claim 5, wherein the diffusion barrier layer is formed of titanium/titanium nitride.